

## REMARKS

### **A. Status of the Claims**

Claims 1-12, 14-35, 38-51 and 61-66 were pending at the time of the last Office Action. Claims 11, 15 and 35 have been amended for the reasons discussed below. No claims have been cancelled. Thus, claims 1-12, 14-35, 38-51 and 61-66 remain pending.

### **B. Claim 11 Has Been Corrected**

As directed, Applicants have amended claim 11 to recite the term “material” after the term “dielectric.”

### **C. Claims 15 and 35 Are Correct**

The Office objects to claims 15 and 35 and requests that the “of” be inserted after “one” in the phrase “at least one permittivity of the at least one grating layer.” The phrase is appropriate as written. Each claim recites that the waveguide grating has:

having a plurality of parameters including at least one permittivity of the at least one grating layer, permittivity of the at least one waveguide layer, periodic structure of the at least one grating layer, grating fill factor of the at least one grating layer, thickness of the at least one waveguide layer, and thickness of the at least one grating layer.

In other words, these claims recite six parameters, not one parameter from among the six that are listed, as the Office suggests. Furthermore, the claimed grating layer may have multiple permittivities. See grating layer 14 in FIG. 2, which possesses  $n_{IH} = 1.632$  and  $n_{IL} = 1.0$ . These claims recite only one such permittivity: thus, these claims use the phrase “at least one permittivity of the at least one grating layer.” The objection is overcome.

Applicants amended claims 15 and 35 to delete the term “variable” from the phrase “variable parameters” in order to clarify the claimed subject matter.

**D. Claims 1, 3, 4, 6, 8-12, 14, 15, 23, 24, 26, 28-35, 46, 62-64 and 66  
Are Patentable over the '300 Patent**

The Office rejects claims 1, 3, 4, 6, 8-12, 14, 15, 23, 24, 26, 28-35, 46, 62-64 and 66 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,598,300 to Magnusson *et al.* ("300 Patent"). Applicants respectfully traverse.

**1. Independent Claim 1**

Claim 1 is directed to a waveguide grating device comprising a guided-mode resonance waveguide grating fabricated on an endface of at least one waveguide. The Office points to the multi-layer reflection filter shown in FIG. 1 of the '300 Patent, and asserts that: (1) the homogeneous layer having a thickness of  $d_1$  qualifies as the "at least one waveguide" recited in independent claims 1, 15, 35 and 38, and (2) the layers from " $d_{n-1}$  to  $d_{n+1}$ " qualify as the guided-mode resonance waveguide grating recited in these independent claims. Final Office Action at page 3. The Office is not correct, and these assertions reveal a fundamental misunderstanding about the FIG. 1 reflection filter disclosed in the '300 Patent. Magnusson Declaration at ¶¶ 3-4.

The structure shown in FIG. 1 and described in the '300 Patent comprises an arbitrary number of unmodulated (homogeneous) and modulated (periodic) layers that are chosen according to the desired application for the resulting filter. *Id.* at ¶ 5; *see also* col. 2, lines 17-52 and col. 4, line 55 – col. 5, line 5. At the time the present application was filed, the FIG. 1 filter from the '300 Patent (like all the filters disclosed in the '300 Patent) was understood by those of ordinary skill in this art as a "guided-mode resonance waveguide grating device" or as a "waveguide grating device" as these terms have been used in the present application. Magnusson Decl. at ¶ 5. In other words, the entire N-layer structure in FIG. 1 is a waveguide grating, and it will resonate at its design frequency or wavelength. *Id.*

Removing one of the layers (such as the homogeneous layer having a thickness of  $d_1$ ) from the FIG. 1 waveguide grating will deviate from the N-layer waveguide grating's design, and the device will no longer work as intended. Magnusson Decl. at ¶ 6. The remaining layers will no longer function as the original waveguide grating, and will not necessarily function as any type of waveguide grating. *Id.* at 6. For this reason, the '300 Patent does not disclose a waveguide grating device comprising a guided-mode resonance waveguide grating fabricated on the endface of at least one waveguide. Accordingly, claim 1 is novel over the '300 Patent, and the rejection of claim 1 and its dependent claims should be withdrawn.

**2. Independent Claim 15**

Independent claim 15 is directed to a system comprising a waveguide grating device that includes a guided-mode resonance waveguide grating fabricated on an endface of at least one waveguide. This claim is novel over the '300 Patent for the same reason as claim 1. Accordingly, the rejection of claim 15 and its dependent claims should be withdrawn.

**3. Independent Claim 35**

Independent claim 35 is directed to a waveguide grating device that comprises a guided-mode resonance waveguide grating fabricated on an endface of at least one waveguide. This claim is novel over the '300 Patent for the same reason as claim 1. Accordingly, the rejection of claim 35 should be withdrawn.

**4. Independent Claim 38**

Independent claim 38 is directed to a method of forming a waveguide grating device that comprises fabricating a guided-mode resonance waveguide grating on an endface of at least one waveguide. This claim is novel over the '300 Patent for the same reason as claim 1. Accordingly, the rejection of claim 38 and its dependent claims should be withdrawn.

## **5. Dependent Claims 3 and 23**

Dependent claims 3 and 23 each recite that the at least one waveguide is rectangular in shape. The Office points to the  $d_1$  layer from FIG. 1 of the '300 Patent as showing a waveguide that is rectangular in shape. Even assuming for the sake of argument that the  $d_1$  layer is a waveguide (which Applicants do not concede), there is nothing in FIG. 1 of the '300 Patent that requires that it be rectangular in shape. While the **cross-section** of the  $d_1$  layer appears rectangular, the shape of the  $d_1$  layer could still be **cylindrical** (or elliptical, hexagonal, etc.), which would be clear only from a **top view** that is not provided. Magnuson Decl. at ¶ 7. The rejection of claims 3 and 23 should be withdrawn for this additional reason.

## **6. Dependent Claims 8, 28 and 63**

Dependent claims 8, 28 and 63 each recite that the at least one grating layer and the at least one waveguide layer comprise the same layer. The Office points to the  $d_1$  layer from FIG. 1 of the '300 Patent as showing a grating layer and a waveguide layer that comprise the same layer. The  $d_1$  layer is a homogeneous layer and, therefore, is not also a grating layer. Magnusson Decl. at ¶ 8. The rejection of claims 8, 28 and 63 should be withdrawn for this additional reason.

## **E. Claims 1-4, 6, 9, 38, 39, 46 and 47 Are Patentable over Farah**

The Office rejects claims 1-4, 6, 9, 38, 39, 46 and 47 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,891,747 to Farah ("Farah"). Applicants respectfully traverse.

### **1. Claim 1**

Claim 1 is directed to a waveguide grating device comprising a guided-mode resonance waveguide grating fabricated on the endface of at least one waveguide. The Office asserts that "Farah discloses a device and method comprising at least one waveguide having an end and endface (fig. 4b, #6) and a waveguide grating on the endface having at least one waveguide layer

and at least one grating layer (fig. 4b, #43).” Final Office Action at p. 5. The Office also states, “Although Farah does not specifically recite the term ‘guided-mode resonance waveguide grating’, the grating of Farah still has the structure that reads on a guided-mode resonance waveguide grating.” Final Office Action at p. 13. The Office is incorrect, and the rejection should be withdrawn.

The operation of the Farah embodiment shown in FIG. 4B is dependent on the redirection of incident light via grating 31 which yields diffracted orders **other than the zeroth order**. Col. 8, lines 31-52. Those diffracted orders are shown in FIG. 4B as 35, and they **are necessary** for the light to couple from one fiber end 1' to the other fiber end 1" across gap 4. Magnusson Decl. at ¶¶ 9-10.

In contrast, the guided-mode resonance waveguide grating that is claimed operates by eliminating such higher order waves. *Id.* at ¶ 10; *see, e.g.*, Specification at page 16, lines 1-15. As Dr. Magnusson explains, the Farah grating is simply not a guided-mode resonance waveguide grating, and no one of ordinary skill in this art would think otherwise. Magnusson Decl. at ¶ 10.

The Office’s bare assertion that “Farah still has the structure that reads on a guided-mode resonance waveguide grating” is not supported by substantial evidence. As the Federal Circuit explained in *Zurko*:

With respect to **core factual findings** in a determination of patentability, however, the Board cannot simply reach conclusions based on its own understanding or experience – or on its assessment what would be basic knowledge or common sense. Rather, the Board **must point to some concrete evidence** in the record in support of these findings.

*In re Zurko*, 258 F.3d 1379, 1386 (Fed. Cir. 2001) (emphasis added). The MPEP provides instruction that follows the *Zurko* decision. MPEP § 2144.03 at 2100-138 (“It is never appropriate to rely **solely** on common knowledge in the art without evidentiary support in the

record as the principal evidence on which the rejection was based.”) (citing *In re Zurko*, 258 F.3d at 1386).

Furthermore, Applicants distinguished diffraction gratings like those used in Farah from those that exhibit the guided-mode resonance effect, as claimed. Magnusson Decl. at ¶ 10; Specification at p. 3, lines 17-22. The Office **must** consider and give effect to such statements when giving the claim language its broadest reasonable interpretation. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997) (noting that it is “unreasonable for the PTO to ignore any interpretive guidance afforded by the applicant's written description” and that the PTO must take “into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in applicant’s specification”).

For these reasons, Farah does not disclose the claimed guided-mode resonance waveguide grating, and the anticipation rejection of claim 1 should be withdrawn. The claims that depend from claim 1 are not anticipated by Farah for at least the same reason.

## **2. Claim 38**

Claim 1 is directed to a method of forming a waveguide grating device that includes fabricating a guided-mode resonance waveguide grating on the endface of a waveguide. Claim 38 and its dependent claims are novel over Farah for the same reasons as claim 1. Accordingly, the anticipation rejection of those claims should be withdrawn.

## **F. Claims 2 and 22 Are Patentable over the Asserted Combination**

The Office rejects claims 2 and 22 as being obvious over the ‘300 Patent in view of U.S. Patent No. 6,488,414 to Dawes *et al.* (“Dawes”). Applicants respectfully traverse. The Office states that “[i]t would have been obvious, to one having ordinary skill in the art at the time the invention was made, to incorporate the device and system of Magnusson *et al.* with the fiber of

Dawes et al., since one would be motivated to make such a modification to send an optical signal over a longer distance with less signal loss.” Final Office Action at p. 6. The Office’s assertion is not supported by substantial evidence, and the rejection should be withdrawn.

As Dr. Magnusson explains in his declaration, it does not make sense to look at Dawes and the ‘300 Patent together for any reason. Magnusson Decl. at ¶ 12. The claim 1 waveguide grating device and the Dawes collimator assembly function completely differently from each other, and are fabricated differently. *Id.* The Dawes collimator assembly projects light to or from a fiber-lens device, and light proceeds in a transmission mode. *Id.* Dawes is not concerned with monitoring a reflected signal or its spectral content, as is possible using the claim 1 waveguide grating device. *Id.* The Dawes collimator assembly would never be used as a filter assembly, which is a possible application of the claim 1 waveguide grating device. *Id.* If someone skilled in this art wanted to make a better beam collimator to optimize coupling from one waveguide to another, they would not use a guided-mode resonance waveguide grating from the ‘300 Patent. *Id.* Furthermore, the claim 1 waveguide grating device would not be used for spatial beam shaping or to optimize coupling from one waveguide to another, as the Dawes device would. *Id.* at ¶ 13.

The claim 15 waveguide grating device includes at least the same limitations as the claim 1 waveguide grating device, so these comments apply with equal force to dependent claim 22.

For these reasons, dependent claims 2 and 22 are patentable over the asserted combination, and the rejection should be withdrawn.

**G. Claims 5, 7, 25, 27 and 40 Are Patentable over the Asserted Combination**

The Office rejects claims 5, 7, 25, 27 and 40 as being obvious over the ‘300 Patent as applied to claims 1, 15 and 38, and further in view of Tibuleac, “Characteristics of Reflection

and Transmission Waveguide-Grating Filters”. Claims 5, 7, 25, 27 and 40 are patentable over the ‘300 Patent for the reasons provided above. Tibuleac does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the ‘300 Patent. The rejection should be withdrawn.

**H. Claims 16-19 and 21 Are Patentable over the Asserted Combination**

The Office rejects claims 16-19 and 21 as being obvious over the ‘300 Patent as applied to claim 15, and further in view of Liu *et al.*, “High-efficiency guided-mode resonance filter”. Claims 16-19 and 21 are patentable over the ‘300 Patent for the reasons provided above. Liu *et al.* does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the ‘300 Patent. The rejection should be withdrawn.

**I. Claim 20 Is Patentable over the Asserted Combination**

The Office rejects claim 20 as being obvious over the ‘300 Patent and Liu *et al.* as applied to claim 19, and further in view of U.S. Patent No. 4,753,529 to Layton (“Layton”). Claim 20 is patentable over the ‘300 Patent in view of Liu *et al.* for the reason provided above. Layton does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the ‘300 Patent. The rejection should be withdrawn.

**J. Claims 39 and 47 Are Patentable over the Asserted Combination**

The Office rejects claims 39 and 47 as being obvious over the ‘300 Patent as applied to claims 38 and 46, and further in view of Dawes and Farah. Applicants respectfully traverse. Claims 39 and 47 are patentable over the ‘300 Patent for the reasons provided above. Neither Dawes nor Farah discloses or suggests a guided-mode resonance waveguide grating fabricated



on the endface of a waveguide, so neither cures the deficiency of the '300 Patent. The rejection should be withdrawn.

**K. Claim 41 Is Patentable over the Asserted Combination**

The Office rejects claim 41 as being obvious over the '300 Patent and Tibuleac as applied to claim 40, and further in view of Dawes and U.S. Patent No. 5,863,449 to Grabbe ("Grabbe"). Claim 41 is patentable over the '300 Patent and Tibuleac for the reason provided above. Neither Dawes nor Grabbe discloses or suggests a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so neither cures the deficiency of the '300 Patent. The rejection should be withdrawn.

**L. Claims 42-44 Are Patentable over the Asserted Combination**

The Office rejects claims 42-44 as being obvious over the '300 Patent, Tibuleac, Dawes and Grabbe as applied to claim 41, and further in view of Hobbs (WO 97/47997). Applicants respectfully traverse. Claims 42-44 are patentable over the '300 Patent, Tibuleac, Dawes and Grabbe for the reasons provided above. Hobbs does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the '300 Patent. The rejection should be withdrawn.

**M. Claims 45 and 48 Are Patentable over the Asserted Combination**

The Office rejects claims 45 and 48 as being obvious over the '300 Patent and Tibuleac as applied to claims 40 and 38, and further in view of U.S. Patent No. 5,291,574 to Levenson *et al.* ("Levenson"). Applicants respectfully traverse. Claims 45 and 48 are patentable over the '300 Patent and Tibuleac for the reasons provided above. Levenson does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the '300 Patent. The rejection should be withdrawn.

**N. Claims 49-51 Are Patentable over the Asserted Combination**

The Office rejects claims 49-51 as being obvious over the '300 Patent as applied to claim 38, and further in view of U.S. Patent No. 6,096,127 to Dimos *et al.* ("Dimos"). Applicants respectfully traverse. Claims 49-51 are patentable over the '300 Patent for the reasons provided above. Dimos does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the '300 Patent. The rejection should be withdrawn.

**O. Claims 61 and 65 Are Patentable over the Asserted Combination**

The Office rejects claims 61 and 65 as being obvious over the '300 Patent as applied to claims 15 and 35, and further in view of Magnusson *et al.* ("Guided-mode resonance Brewster filter"). Applicants respectfully traverse. Claims 61 and 65 are patentable over the '300 Patent for the reasons provided above. The cited Magnusson reference does not disclose or suggest a guided-mode resonance waveguide grating fabricated on the endface of a waveguide, so it does not cure the deficiency of the '300 Patent. The rejection should be withdrawn.

**P. Petition for Extension of Time in this and Future Responses**

Pursuant to 37 C.F.R. § 1.136(a), Applicants petition for a 3-month extension of time in which to respond to the May 31, 2005 Final Office Action. If the check is inadvertently omitted, or should any additional fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to the enclosed materials, or should an overpayment be included, the Office is authorized to deduct or credit the appropriate fees from or to Fulbright & Jaworski Deposit Account No.: 50-1212/UTSL:058US.

The Office is further authorized to treat any concurrent or future reply that requires a petition for an extension of time under 37 C.F.R. § 1.136(a) to be timely as incorporating a petition for an extension of time for the appropriate length of time, and to deduct all required fees

under 37 C.F.R. §§ 1.16 to 1.21 relating to any such replies of other relevant papers from Fulbright & Jaworski Deposit Account No.: 50-1212/UTSL:058US.

**Q. Conclusion**

Applicants respectfully submit that claims 1-12, 14-35, 38-51 and 61-66 are in condition for allowance. Should the examiner have any questions, comments, or suggestions relating to this application, he **and Supervisory Examiner Glick** are invited to contact the undersigned attorney at (512) 536-3031 in an effort to narrow any perceived patentability issues and advance prosecution as quickly as possible.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Mark T. Garrett", written in a cursive style.

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